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SOCIAL CLASS EFFECTS ON CONCEPT ATTAINMENT.

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SEVERAL EXPERIMENTS ON THE CONCEPTUAL BEHAVIOR OF LOWER AND MIDDLE CLASS CHILDREN ARE DESCRIBED IN AN EFFORT TO CLARIFY AN APPARENT DISCREPANCY BETWEEN PREVIOUS LABORATORY FINDINGS AND OBSERVED CLASSROOM PERFORMANCE. IN THE FIRST EXPERIMENT, INDUCTIVE CONCEPT LEARNING WAS INVESTIGATED AS A FUNCTION OF SOCIAL CLASS MEMBERSHIP AND PRIOR EXPERIENCE. THE EFFECTS OF TRAINING WERE EQUAL IN THE TWO SOCIOECONOMIC GROUPS. THERE WAS NO SIGNIFICANT DIFFERENCE BETWEEN THE TWO SOCIAL CLASSES BEFORE OR AFTER TRAINING. A SECOND EXPERIMENT WAS CONDUCTED TO DETERMINE IF THE LACK OF EXPECTED SOCIAL CLASS DIFFERENCES WAS DUE TO THE METHOD OF SUBJECT SELECTION WHICH EXCLUDED CHILDREN WITH VERY HIGH OR LOW INTELLIGENCE QUOTIENTS OR TO THE FACT THAT TASK INSTRUCTION WAS ESPECIALLY EXPLICIT. DATA ANALYSIS REVEALED THAT BOTH INSTRUCTIONS AND SOCIAL CLASS CONTRIBUTED SIGNIFICANTLY TO THE TOTAL VARIANCE. SINCE TRANSFER EFFECTS ASSOCIATED WITH PRETRAINING WERE OF EQUAL MAGNITUDE FOR BOTH GROUPS, THE IDEA THAT CULTURALLY DEPRIVED CHILDREN ARE DEFICIENT IN THE CAPACITY FOR SELF-INSTRUCTION IS DISMISSED. STILLER'S FINDINGS THAT THE PERFORMANCE OF THE EXTREME ABILITY SUBJECTS ACCOUNTS FOR SOCIAL CLASS DIFFERENCES IN PERFORMANCE ARE SUPPORTED. RESULTS INDICATE THAT SOCIAL CLASS STATUS PLAYS NO PART IN CONCEPT LEARNING. THIS PAPER WAS PRESENTED AT THE AMERICAN PSYCHOLOGICAL ASSOCIATION CONVENTION, WASHINGTON, D.C., SEPTEMBER 1, 1967. (PR)

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Social Class Effects on Concept Attainment[1]

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We are currently witnessing an upsurge of interest in the intellectual development of the culturally impoverished child. This interest is aimed at a better understanding of the nature of his deficits with the fond hope that the knowledge gained will facilitate the design of remedial procedures. The end product of development is well known -- poor scores on intelligence tests and widespread and profound school retardation which augments with age. How to conceptualize the nature of the deficit is another matter. The questions ordinarily asked in the laboratory have so far not yielded profound insights into the process of development under conditions of environmental deprivation. Perhaps we don't ask the right questions about the processes which transform cultural experiences into academic efficiency.

Experimental efforts at analyzing the nature of the deficit of the deprived child have often served to complicate the issue. A number of laboratory investigations of learning and problem solving have failed to turn up consistent differences between low and middle class children. In view of the large differences in IQ and in school achievement between these two populations, the laboratory findings seem paradoxical. It is possible, of course, that the laboratory problems do not tap the relevant abilities. Perhaps they are too simple or their pertinence to school type tasks too remote; or it may be that the laboratory setting with its usual

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immediate reinforcement is more effective in eliciting better performance from low class children than the less structured school situation with its ambiguous goals and a remote system of reinforcements.

Whatever the actual reasons may be, consistent social class differences in performance are difficult to come by in the laboratory.

When we started our research in cognitive functioning of lower class children, we accepted the common belief that the deficits of disadvantaged children are especially grave in areas requiring abstraction and logical thinking. We therefore set out to study conceptual behavior, since concept attainment tasks require that the subject be able to abstract as well as make inferences about the correctness of his response. Because our problems were difficult, we anticipated that low class children would perform more poorly than middle class children. From an analysis of their performance we hoped to pinpoint at least some of the processes which presented the most serious obstacles to problem solution.

The experiments which I will describe today were performed in our laboratory in collaboration with Dr. Ellin Kofsky.

Our initial experimental task was a complex inductive concept attainment problem. As we had anticipated that low status children would learn more poorly than their middle class counterparts, we postulated that such differences in performance might be related to two factors: (1) experience in discriminating the stimulus attributes and (2) experience in inductive problem solving. Consequently, training tasks were devised to provide both types of experiences to half the children in each social class group. We predicted that since middle class children were more

likely to have had these types of experiences prior to the experimental session, our training in the laboratory would be of greater benefit to the low class than middle class subjects. We therefore expected a training by social class interaction effect. In other words, we not only anticipated an initial quantitative difference in performance as a function of social class, but also a difference in responses to the experimental interventions we had provided.

In the first study we examined a total of 192 children, divided into two age groups, 5 and 8 years, and drawn equally from two areas of Baltimore which assured maximum social class differentation. The status difference between the two groups was confirmed by the mean IQ scores obtained on the WISC, which were 89 and 111 respectively. In order to assure ourselves that the two groups of Ss were typical in ability of their social class, they were selected to be within one standard deviation of the mean IQ of their groups. Thus the low class children ranged in IQ between 75 and 101 and the middle class range was 102 to 123. All of our subjects were Caucasian.

An inductive concept problem was presented to the subjects. Essentially they were required to learn the correct response for each of a group of stimuli consisting of pictures of geometric figures which varied in form, color, size and number. Each stimulus was presented individually and the child had to select an appropriate lever for that stimulus. There were only two levers to choose from. For example, he might be required to learn that the color of the stimulus was the important feature, and that blue stimuli give marbles when the right lever is pressed,

and red when the left lever is pressed. He would then have to ignore the shape, size and number dimensions, as they are irrevelant for this problem. A correct response was reinforced with a marble. The child knew that if he received a large number of marbles he could exchange them for a prize of his own choice and most children showed much interest in winning marbles.

The problems were of two levels of difficulty, suitable to the two subject ages. The eight-year-olds worked on a four dimensional problem, consisting of 16 stimuli, while the five-year-olds worked on a three dimensional problem consisting of 8 stimuli.

All children were carefully instructed on the nature of the task and allowed to work on an illustrative problem before attempting the concept learning problem. Following the illustrative problem, half the Ss then proceeded to the concept attainment problem. The other half received, in addition, training in discrimination learning. The discrimination learning utilized the lever pressing procedure described above. The stimuli were unidimensional, each dimension being one of those constituting the stimulus set used in the concept task. For example, the required discrimination might be between a large black circle and a small black circle. Obviously, size was the relevant cue here. This procedure was repeated until each of the stimulus dimensions included in the concept task had been used singly in a discrimination problem. The objective was to see whether experience with the component dimensions of the task and practice in the solution of simple problems resulted in positive transfer on the solution of complex problems, and, more particularly, to what extent the two subject populations profited from this experience.

To recapitulate, then, we were investigating inductive concept learning as a function of social class membership and prior experience in discrimination learning of the dimensions constituting the concept stimuli.

And now we come to the results. The data were first analyzed in terms of the number of Ss who attained criterion. Table 1 shows these data.

We see here substantial differences produced by training. However, the effects of training were equal in the two socioeconomic groups. Furthermore, we see no significant differences between the two social classes, either before or after training. Age comparisons cannot be made because the two age groups worked on different problems.

Table 2 shows the error data; and the results are essentially the same. Training brought about a substantial reduction in errors, but again the children at both socioeconomic levels performed equally well at the start and profited equally much from training. Although there was a mean difference of ten errors between the two untrained 8-year-old groups, the difference was not sufficiently large to be significant. I want particularly to call attention to this difference because of some other findings I will report later in the paper. To summarize the results of this first study, while we found consistent training effects, no differences in performance were found between the low and middle class Ss either before or after training.

We were puzzled by these results, as we had fully anticipated that with difficult conceptual problems we would obtain social class differences. And we know that the problems were difficult because only 45 percent of the untrained Ss attained criterion. We also analyzed the data for

strategies employed. For some time we had been studying strategies pursued by Ss who failed to attain criterion. We had found in several previous studies that most young failing subjects perseverated on irrelevant stimulus dimensions or followed position or alternation strategies. In examining the data from the present study, we found that failing subjects from both populations showed similar perseverative patterns. It seemed, therefore, that so far as we could determine, the performance of the low and middle class children was in every way alike.

In view of a widespread belief, that disadvantaged children suffer from a cognitive deficit, we felt impelled to continue the search for an explanation of our results. A reexamination of the experimental design suggested two possible explanations for our findings: one was related to subject selection and the other to our training procedures. It may be recalled that in order to assure ourselves of representative subject groups we accepted into the study only those Ss whose IQs were within one standard deviation of their population means. In effect this method of subject selection served to exclude children with very low and very high IQs. Since there is some evidence to suggest that it is the Ss at the extremes of the IQ distribution who account for social class differences (Siller, 1957), it may be that in the present study possible differences were obscured by our method of subject selection.

There was another aspect of the procedure which may have reduced social class differences, and this was the method of instructing the subjects. Because we had thought that young lower class children would be more likely to misunderstand verbal instructions, each S was not only

instructed verbally but also given an illustrative problem. In retrospect we thought that this thorough pretraining may have served to erase problem solving differences associated with social class membership. We based this tentative assertion on two grounds. The first was earlier evidence obtained in our laboratory (Osler and Weiss, 1962) indicating that performance differences reflecting intellectual function are most apparent when instructional cues are minimal. We found that for Ss of superior intelligence it made no difference whether instructions were explicit or vague, whereas less intelligent children worked more poorly under vague instructions. Secondly, mediation theory posits that intellectual growth is associated with increasing ability to supply verbal mediators that facilitate problem solving. It seemed reasonable, therefore, to postulate that had we not overinstructed our Ss, differences in intellectual ability might have been manifest in the two social class groupings.

To recapitulate, two aspects of our experimental procedure have been described which may have obscured differences in problem solving ability of our subjects. These aspects were subject selection and task instruction.

In order to obtain evidence on the two hypotheses, we conducted another experiment in which subject selection was random within each social class, without regard to IQ, and the instructions varied in specifity. In this study we had 192 8-year-old subjects. Because of very high subject variability in the previous study, we thought it advisable to increase the number of Ss per group and therefore confined this investigation to one age level. The 192 Ss represented both social classes equally and within each SE group the subjects were further subdivided into two groups according to

the instructions received. One group at each SE level received the same verbal instructions and illustrative problem as was described in the previous study. The other half of the Ss received only minimal verbal instructions and no illustrative problem. The point of this procedure was to see whether an unstructured situation in which the subject was required to define the task for himself, would present more of a challenge to a low class than middle class child.

And now for the results. Table 3 shows the errors to criterion. We see here again substantial transfer effects associated with the more complete instructions. Social class effects are much smaller but consistent under both conditions. An analysis of these data revealed that both main effects, i.e., instructions and social class, contributed significantly to the total variance. There was, however, no interaction effect; complete instructions facilitated performance equally at both social class levels.

To interpret the results we need first of all to refer to our hypothesis that lower class children may be deficient in their capacity for providing the type of mediating self-instructions which facilitate problem solving. Our results flatly contradict this notion. Transfer effects associated with pretraining were of equal magnitude in both social class groups. We must, therefore, dismiss the idea that culturally deprived children are deficient in the capacity for self-instruction.

What about the second hypothesis, that subject selection unrestricted with respect to IQ may reveal social class differences which are not manifest when a restricted range of subjects is used. Since the social class effect, obtained in this study, was not related to the type

of instructions given, it looks as if it were brought about by the method of subject selection. Such a conclusion would be consistent with Siller's (1957) findings that it is the performance of the extreme ability subjects that accounts for social class differences in performance.

To test this interpretation we compared the scores obtained by the instructed subjects in the present study with those of the 8-year-old Ss who had received the same treatment in the first investigation (the untrained groups). The error scores in the two studies were very similar (54.8 vs 50.7 for the low class Ss and 44.6 vs 42.0 for the middle class), thus precluding an explanation of the results in terms of subject selection. Since our two independent variables turned out to be ineffectual, we face the problem of explaining the difference in results between the two experiments. We now believe that what appears as an inconsistency is merely a statistical artifact. It will be recalled that because of the high subject variability we increased the N to 48 per group in this experiment, while N was only 24 per group in the earlier one. As a consequence, the same order of error difference was significant in one case and not significant in the other case. However, more relevant than the matter of significance is the importance of the differences obtained. An examination of the data shows that the social class variable accounts for less than 2 percent of the total variance, as compared, for example, with the type of concept which accounts for 17 percent of the variance. It looks, therefore, as if the SE difference, despite its statistical significance in the second study, is inconsequential.

In making social class comparisons, it must be borne in mind that children of different socioeconomic status also vary in measured intelligence. In the present case there was a mean difference of 22 WISC IQ points between the low and middle class subjects. To what extent did variation in intelligence contribute to performance on the concept problem? We calculated a correlation coefficient between IQ and errors to criterion and obtained a correlation of -.23 which for our sample size was highly significant. However, since IQ and social class are confounded and since Jensen and others have observed that the IQ has more predictive power in middle class than lower class groups, it seemed desirable to analyze each social class separately. Table 4 shows these results. Of the four subgroups one lower class and one middle class group showed significant correlations while the other two groups failed to do so. However, among the low class subjects intelligence was related to errors in the instructed group, while in the middle class group the opposite was the case. There the role of intelligence was evident in the group which had received minimal instructions. It is not easy to interpret the data, especially since the overall error performance of the two social classes across instructional conditions was very similar.

Let me now try to summarize the data from both studies.

Two investigations were described which required the subjects to solve complex inductive concept problems under three experimental conditions. The subjects differed in age and socioeconomic status and also in intelligence. The performance of the Ss was evaluated in terms of success in attaining criterion, the number of errors, the kinds of strategies pursued, and the correlation between the IQ and the number of errors. The critical

independent variable was social class status. The findings were consistent in failing to reveal substantive social class differences in errors or in strategies pursued. The responses of the children from the two social classes to the special conditions of pretraining were also equivalent. These latter results demonstrated that the two groups were equally able to profit from aids provided by the several experimental conditions.

We have thus arrived through a rather circuitous route to the support of the null hypothesis on the role of social class status in concept learning. As we all know, data consistent with the null hypothesis are not as convincing as those rejecting the null hypothesis. Failure to obtain differences inevitably raises questions in the experimenter's mind about the discriminative power of the task, or its relevance to the hypothesis being tested, or about flaws in the experimental procedure. We have had much experience with our experimental tasks and have repeatedly demonstrated their sensitiveness to difference in age, to reinforcement schedules, to instructions, and to a variety of training conditions. Their failure to discriminate between the two social classes in the present studies, cannot, therefore, be attributed to a lack of sensitiveness or a lack of relevance, but more likely to the nature of the two populations studied.

On the basis of our evidence we feel justified in concluding that Caucasian children from low and middle classes perform equally well on complex concept attainment problems. We are not alone in reporting equivalent learning ability in children of disparate social status. Rohwer (1967) reports no difference in learning paired associate tasks; Zigler and deLabry (1962) and Spence and Segner (1967) have obtained similar

finding on discrimination learning tasks, and Siller (1957) reports essentially the same results on concept tasks.

We return, therefore, to the dilemma presented in the early portion of this paper - the large discrepancy between school learning and experimental learning in lower class children. Our own experiments have only served to underscore the dilemma. We feel tempted now to engage in some post hoc conjectures regarding differences between learning in the usual school setting and learning in the laboratory. We propose for consideration four such differences. The first lies in the novelty of experimental tasks. As is well known, novelty enhances attention, which, in turn facilitates performance. Second, in the laboratory setting it is frequently the case that the child works alone with an experimenter, and this fact may sustain his motivation to succeed. Third, in the laboratory the child usually receives immediate feedback regarding the quality of his performance, whereas in school the time gap between performance and feedback may be so large as to weaken its effectiveness as a reinforcer. The important point in connection with these differences is that they may operate differentially in favor of the lower class child.

The fourth, and perhaps the most important difference between the school and laboratory situations lies in the greater reliance of school learning on previously acquired specific knowledge. Laboratory learning tasks, on the other hand, such as paired associate or discrimination learning do not require any specific previously acquired knowledge. To be sure, in concept learning it may be helpful if the child already knows the names for squares or circles and red and blue colors, but this

kind of informational requirement is usually possessed in some form by all children and is a much less specific requirement than, for example, having to know the multiplication table before one can do long division. It might be both interesting and useful to study systematically the effects of the variables differentiating school and laboratory learning.

I would like to end this presentation with a proposal that we reconsider the notion of cognitive deficit as applied to lower class children. Cognitive deficit implies a deficiency of techniques for mastering problems of increasing complexity. It implies a limitation in the capacity to learn. We have no evidence that this is the case with lower class children. We do know, of course, that many of them fail to acquire the skills and knowledge which their more privileged peers succeed in mastering. But their failure to acquire knowledge constitutes no proof of their incapacity to do so. To the extent that we can place reliance on the laboratory findings, they deomonstrate the capacity of the lower class child to learn as efficiently as the middle class child. To describe his school retardation, it may therefore be more useful to attribute an <u>achievement</u> deficit to him rather than a <u>cognitive</u> deficit. This term comes closer to the data, and being more specific, may be suggestive of the kind of research that is likely to advance our understanding of the intellectual development of the child reared in an impoverished environment.

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Footnote

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Table 1

Number of Ss who Attained Criterion
as a Function of Social Class and Training
in Discrimination Learning

	Age			
	5 years		8 years	
Condition	U[a]	T	U	T
Low Class	10	17	10	19
Middle Class	10	15	13	19

N = 24 in each group

[a] U - untrained
T - trained

Table 2

Mean Errors to Criterion as a Function of Social Class and Training in Discrimination Learning

	Age			
	5 years		8 years	
Condition	U[a]	T	U	T
Low Class	54.4	33.3	54.8	23.1
Middle Class	53.3	39.7	44.6	29.5

N = 24 in each group

a U - untrained
T - trained

Table 3

Mean Errors to Criterion as a
Function of Completeness of Instructions

	Type of Instruction	
	Minimal	Complete
Low Class	64.8	50.7
Middle Class	56.0	42.0

Each figure represents the mean of 48 scores

Table 4

Correlation Coefficients between Errors to Criterion and IQ (WISC) within Social Class and Instruction Groups

Group	r	df	p
Low Class			
Minimal Instruc.	-.16	46	ns
Complete Instruc.	-.29	46	.05
Middle Class			
Minimal Instruc.	-.30	46	.05
Complete Instruc.	-.18	46	ns